

CLAIMS

1. A polishing composition, comprising (A) a compound having three or more azole moieties, (B) an oxidizing agent, and (C) one or more species selected from among an amino acid, an organic acid, and an inorganic acid.

2. The polishing composition according to claim 1, wherein the compound having three or more azole moieties (A) is a polymer of an azole having a vinyl group.

3. The polishing composition according to claim 1 or 2, wherein the compound having three or more azole moieties (A) is soluble in water.

4. The polishing composition according to any one of claims 1 to 3, wherein the compound having three or more azole moieties (A) has a mass average molecular mass in a range of 300 to 5,000,000.

5. The polishing composition according to any one of claims 1 to 4, wherein the content of the compound having three or more azole moieties (A) is in a range of 0.001 to 1 mass%.

6. The polishing composition according to any one of claims 1 to 5, wherein amino acid comprises at least one species selected from the group consisting of glycine, L-alanine, β -alanine, L-2-aminobutyric acid, L-norvaline, L-valine, L-leucine, L-norleucine, L-isoleucine, L-allo-isoleucine, L-phenylalanine, L-proline, sarcosine, L-ornithine, L-lysine, taurine, L-serine, L-threonine, L-allo-threonine, L-homoserine, L-tyrosine, 3,5-diiodo-L-tyrosine, β -(3,4-dihydroxyphenyl)-L-alanine, L-thyroxine, 4-hydroxy-L-proline, L-cysteine, L-methionine, L-ethionine, L-lanthionine, L-cystathionine, L-cystine, L-cysteic acid, L-aspartic acid, L-glutamic acid, S-(carboxymethyl)-L-cysteine, 4-aminobutyric acid, L-asparagine, L-glutamine, azaserine, L-arginine, L-canavanine, L-citrulline, δ -hydroxy-L-lysine, creatine, L-kynurenine, L-histidine, 1-methyl-L-

histidine, 3-methyl-L-histidine, ergothioneine, and L-tryptophan.

5 7. The polishing composition as described in any one of claims 1 to 6, wherein the organic acid comprises at least one species selected from the group consisting of formic acid, acetic acid, propionic acid, butyric acid, valeric acid, 2-methylbutyric acid, n-hexanoic acid, 3,3-dimethylbutyric acid, 2-ethylbutyric acid, 4-methylpentanoic acid, n-heptanoic acid, 2-methylhexanoic acid, n-octanoic acid, 2-ethylhexanoic acid, benzoic acid, glycolic acid, salicylic acid, glyceric acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, maleic acid, phthalic acid, malic acid, tartaric acid, citric acid, and lactic acid.

10 8. The polishing composition According to any one of claims 1 to 7, wherein the inorganic acid is sulfuric acid, nitric acid, phosphoric acid, or a salt thereof.

15 9. The polishing composition According to any one of claims 1 to 7, wherein the content of the one or more species selected from the group consisting of an amino acid, an organic acid and an inorganic acid (C) is in a range of 0.001 to 10 mass%.

20 10. The polishing composition According to any one of claims 1 to 9, wherein the oxidizing agent comprises at least one species selected from the group consisting of oxygen, ozone, hydrogen peroxide, alkyl peroxides, peracids, permanganate salts, periodate salts, persulfate salts, polyoxo acids, and hypochlorite salts.

25 11. The polishing composition According to any one of claims 1 to 10, wherein the content of the oxidizing agent (B) is in a range of 0.01 to 30 mass%.

30 12. The polishing composition according to any one of claims 1 to 11, which further contains a surfactant.

35 13. The polishing composition according to claim 12, wherein the surfactant comprises at least one species selected from the group consisting of anionic surfactants, cationic surfactants, nonionic surfactants,

and ampholytic surfactants.

14. The polishing composition according to claim 13, wherein the surfactant is at least one species selected from the group consisting of an alkylaromatic-sulfonic acid or a salt thereof, polyoxyethylene alkyl phosphoric acid or a salt thereof, alkyl phosphoric acid or a salt thereof, and a fatty acid or a salt thereof.

15. The polishing composition according to any one of claims 1 to 14, wherein the content of the surfactant is in a range of 5 mass% or less.

16. The polishing composition According to any one of claims 1 to 15, which further contains a protective-film-forming agent.

17. The polishing composition According to claim 16, wherein the content of the protective-film-forming agent is in a range of 5 mass% or less.

18. The polishing composition according to claim 17, wherein the protective-film-forming agent comprises at least one species selected from the group consisting of benzotriazole, tolyltriazole, hydroxybenzotriazole, carboxybenzotriazole, benzimidazole, tetrazole, and quinaldinic acid.

19. The polishing composition according to claim 18 or 19, wherein the content of the protective-film-forming agent is in a range of 10 mass % or less.

20. The polishing composition according to any one of claims 1 to 19, which further contains an alkali substance.

21. The polishing composition according to claim 20, wherein the alkali substance comprises at least one species selected from the group consisting of ammonia, amines, polyamines, alkali metal compounds, and alkaline earth metal compounds.

22. The polishing composition according to claim 20, wherein the content of the alkali substance is in a range of 10 mass% or less.

23. The polishing composition according to any one

of claims 1 to 22, which further comprises an abrasive.

24. The polishing composition according to claim 23, wherein the abrasive comprises at least one species selected from the group consisting of silica, alumina, ceria, titania, and organic abrasive.

25. The polishing composition according to claim 23, wherein the content of the abrasive is in a range of 30 mass% or less.

26. The polishing composition according to any one of claims 1 to 25, which has a pH of 5 to 11.

27. The polishing composition according to any one of claims 1 to 26, which is used for polishing a metal film provided on a substrate having trenches such that the metal film fills the trenches.

28. The polishing composition according to any one of claims 1 to 26, wherein a ratio (P_{RR}/B_{RR}), between a metal film polishing rate (P_{RR}) for polishing a metal film formed on a substrate having trenches such that the metal film fills the trenches, or polishing a metal film formed on a substrate having trenches and a barrier metal film formed on the substrate such that the metal film fills the trenches, and a metal film polishing rate (B_{RR}) for polishing a flat blanket metal film, is 3.5 or more.

29. A composition which forms the polishing composition as set forth in any one of claims 5, 9, 11, 15, 17, 19, 22 and 25 by dilution.

30. A kit comprising a plurality of compositions, which forms the polishing composition as set forth in any one of claims 1 to 28 by mixing or by mixing and dilution.

31. A polishing method comprising forming a metal film provided on the substrate such that the metal film fills the trenches, by use of the polishing composition as set forth in any one of claims 1 to 27.

32. A polishing method comprising forming a barrier metal film on a substrate having trenches, and polishing, by use of the polishing composition as recited in any one

of claims 1 to 27, a metal film provided on the substrate such that the metal film fills the trenches.

5 33. A polishing method comprising a metal film, wherein a metal film formed on a substrate having trenches such that the metal film fills the trenches, or a metal film formed on a substrate having trenches and a barrier metal film formed on the substrate such that the metal film fills the trenches, has protrusions, and corners of the protrusions are preferentially polished by
10 the composition as set forth in any one of claims 1 to 27.

34. The polishing method according to claim 33, wherein the metal film comprises copper, a copper-containing alloy, iron, or an iron-containing alloy.

15 35. The polishing method according to claim 33 or 34, wherein the barrier metal film comprises tantalum-containing metal such as tantalum or tantalum nitride.

20 36. The method for polishing a substrate, the method comprising planarizing, by use of the polishing composition as recited in any one of claims 1 to 28, a metal film provided on a substrate having trenches such that the metal film fills the trenches.

25 37. The method for producing a substrate, the method comprising a step of polishing, through the polishing method as recited in any one of claims 31 to 36, a metal film provided on a substrate having trenches such that the metal film fills the trenches.

38. A method for using the composition as set forth in claim 29 as a transportation or storage composition.

30 39. A method for using the composition as set forth in claim 30 for transportation or storage compositions.